Miscellaneous Paper No. 29
CALIFORNIA FOREST AND RANGE EXPERIMENT STATION
FOREST SERVICE - U. S. DEPARTMENT OF AGRICULTURE

February 1959

A Better Insecticide for Pine Engraver Beetles

Lindane looks like a good bet
less costly control of certain bark
etles. In laboratory tests started a few
ars ago, this insecticide proved highly
ic. Small-scale, simulated field tests
1958 have borne out the laboratory find-
s. If lindane sprays prove to be as
ective as we think, they will cut the cost
direct control drastically—as much as
2 to 9/10 in material costs alone. And
ey may be effective for preventing some
etle attacks; currently used sprays can-
t.

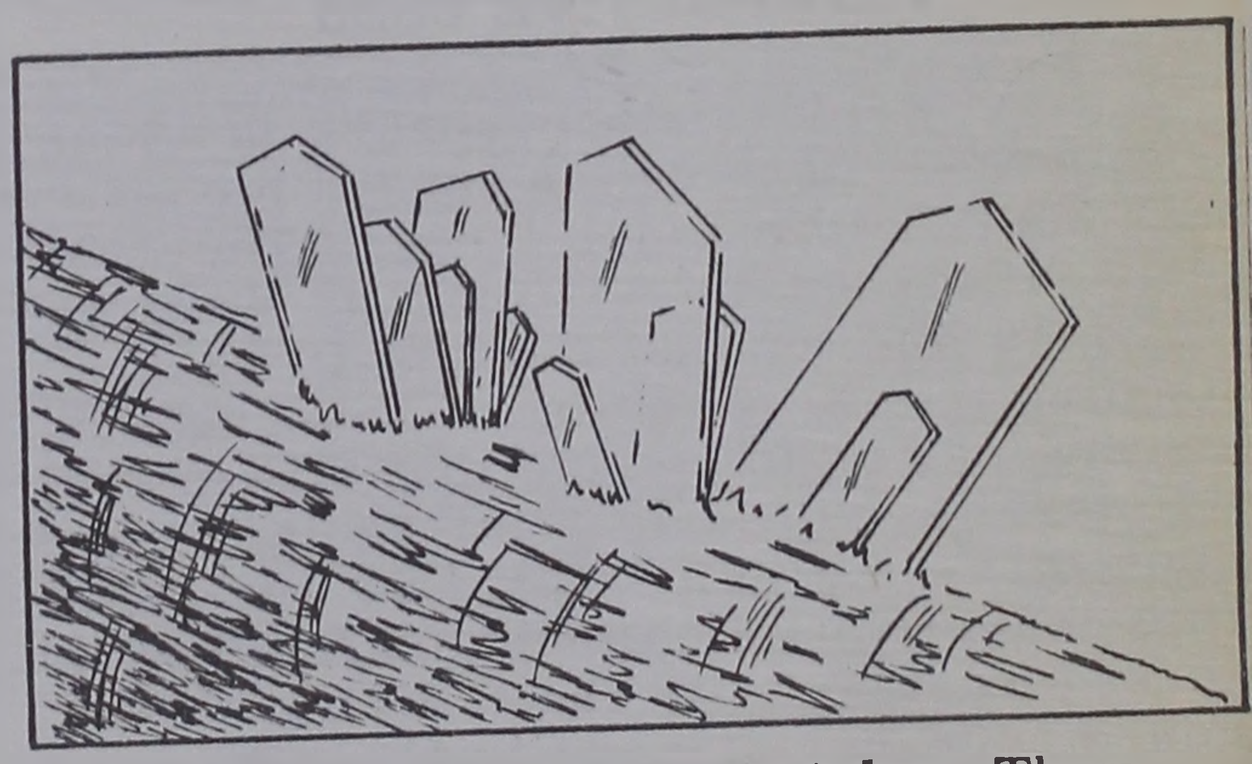
WHY IS LINDANE EFFECTIVE?

Laboratory and field studies
owed that vast differences exist in the
xicity of each insecticide to different
rk beetles. Lindane proved highly toxic
pine engravers—as little as 0.0001
nce per square foot of bark is lethal.
ne secret of its success lies in the form
takes after being sprayed on the tree
d in its residual action.

Lindane forms tiny crystals on
e bark surface. The crystals grow
rectly out of the bark after it has been
prayed lightly with a mixture of lindane
nd kerosene. Laboratory studies showed
at the shape and size of these crystals
re critical factors in toxicity; and the
958 trials proved that the crystals were
oxic to pine engravers when formed on
ne bark. The beetles become contami-
ated after they tunnel to the surface
ecause they habitually walk about a few
moments, flexing their muscles before flying away. In this brief stroll, the beetles pick up a lethal dose of crystals.

Residual insecticides, like lindane and its relative DDT, stay toxic for a long time. They are designed to kill by contact: as insects walk over the chemical, it sticks to their feet and then is rapidly absorbed.

Penetrating sprays like ethylene dibromide (EDB) are now used to control bark beetles in California. They act in a different way, for they are fumigants. To kill the insects, they must be applied heavily to wet the bark and penetrate to the beetle in its burrow under the bark. A lot of spray is needed to reach the beetles and it soon loses its toxicity.



-- Sketch of lindane crystals. They are so small that dozens of them occupy an area one-half the size of the period that ends this sentence.

HOW DOES LINDANE COMPARE WITH PRESENT SPRAYS?

Material costs. —The ethylene dibromide sprays now used are made with oil for thick-barked trees and with water for thin-barked ones. Here are some comparative costs:

For an 18-inch diameter tree--	
EDB in oil	$ 2.70
EDB in water	1.00
lindane in kerosene	.50
For a 36-inch diameter tree--	
EDB in oil	10.50
EDB in water	2.15
lindane in kerosene	1.00

Labor costs. —Workers using EDB sprays must fell the tree, limb it, and buck the infested section of the trunk into short logs. They must drench each log until puddles are formed in the bark crevices, and let the spray soak into the bark. This means that the log must be rolled two to four times until the entire surface is soaked. Using residual-type sprays, workers need only fell the infested tree, limb it, and lightly coat the bark with lindane spray.

Transportation costs. —Cost of transportation can be sizable when sprays have to be taken back into the forest to control bark beetle outbreaks. With lindane sprays, these costs may be cut by as much as 80 percent, for only one-fifth as much lindane as EDB would be needed to treat a given number of trees.

PROSPECTIVE USES

Residual-type sprays promise to supersede penetrating sprays for killing bark beetles in infested trees. They can be used against infestations in slash and pull logs and against beetles in short standing trees. Results of research on lindane lead us to believe that this insecticide merits full scale trial against pine engravers, the guinea pigs in our tests. This group of beetles includes some of the worst forest pests. The California five-pined engraver alone kills about 40 million board feet of timber a year and it weakens other trees so that they are easy prey for even more destructive bark beetles.

We do not recommend lindane for controlling other bark beetles until tests have proved its worth.

Residual-type sprays have one prospective use that penetrating sprays do not. When sprayed on healthy standing trees, they may be effective in protecting the trees from bark beetle attacks. A protective spray would be especially useful where individual trees are highly valued as in recreation sites and seed orchards. The protection of sawlogs from bark beetle attacks and consequent fungus infections, and the protection of slash are also possibilities.

Pine Engraver Beetle (x 5)

TRIALS NEEDED

According to adage: "The proof of the pudding is in the eating". Laboratory findings sometimes turn out to be inapplicable when tried on an operational scale. Whether lindane sprays have drawbacks that we have not foreseen can be told only by large-scale field trials. This is the next step in putting to work the results of residual spray research. The Station can suggest dosage rates, equipment and procedures for staging such trials. Write to the Director, California Forest and Range Experiment Station, P. O. Box 245, Berkeley 1, California.

Much is yet to be learned about the potentialities of residual insecticides. Lindane is but one of several chemicals being studied and pine engravers only one of the test insects. Through laboratory and field studies, the Station is continuing a search for the most effective chemicals and type of deposit. The goal of this research is the best possible combination of ingredients to control each of the major bark beetles in California.

--Compiled from material furnished by R. L. Lyon, entomologist, Division of Forest Insect Research.